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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/698,926	10/31/2003	D. Amnon Silverstein	200206546-1	2987

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EXAMINER
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MADDEN, GREGORY VINCENT

ART UNIT	PAPER NUMBER
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2622

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	Application No. 10/698,926	Applicant(s) SILVERSTEIN, D. AMNON	
	Examiner Gregory V. Madden	Art Unit 2622	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 17 August 2007.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-11, 15-22 and 24-27 is/are pending in the application.
- 4a) Of the above claim(s) 24-26 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-11, 15-22 and 27 is/are rejected.
- 7) ☒ Claim(s) 24-26 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 31 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

**DETAILED ACTION*****Response to Arguments***

Applicant's arguments with respect to claims 1, 7, 17, and 27 have been considered but are moot in view of the new ground(s) of rejection.

First, regarding claim 1, the Applicant argues that the Cathey reference (WO 01/99431 A1) fails to disclose color sensor arrays that are "...arranged elevationally over one another and configured to receive respective ones of the color components in combination with the limitations that the color sensor arrays overlap and are offset with respect to one another as positively claimed" (See Remarks, Pg. 7). While the Examiner does believe that Cathey discloses that color sensor arrays for red, green, and blue are physically repositioned to overlap and be offset (note the Abstract of Cathey, which states "...methods and apparatus for increasing resolution in digital imaging systems reposition the fixed detector arrays..."), the Applicant's arguments are nonetheless considered to be moot in view of a new ground of rejection citing Colvocoresses (U.S. Pat. 4,765,564). As will be noted in further detail below, the Colvocoresses reference teaches all the of the limitations of newly-amended claim 1, including the claimed color sensor arrays "...arranged elevationally over one another and configured to receive respective ones of the color components in combination with the limitations that the color sensor arrays overlap and are offset with respect to one another..." Please refer to the new ground of rejection set forth below.

As for claim 7, the Applicant again argues that the Cathey reference does not teach the all of the amended claim limitations, including that the optical device is configured to output the color components in a direction which is the same as the direction of travel of received light, and again that the color sensor arrays are arranged elevationally over one another and configured to receive respective ones of the color components in combination with the limitations that the color

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sensor arrays overlap and are offset with respect to one another. However, as noted above, the Applicant's arguments are considered moot in view of a new ground of rejection citing the Colvocoresses reference. Please refer to the rejection to claim 7 set forth below.

Next, considering claim 17, the Applicant contends that he Cathey and the Yamanaka references fail to teach that an optical device is used to receive light, wherein the light components are output in the same direction of travel of the received light (See Remarks, Pg. 9). However, the Applicant's arguments are considered moot in view of a new ground of rejection citing Colvocoresses in view of Langworthy (U.S. Pat. 4,654,698). As will be set forth below, the combination teaches the outputting of the light components in the same direction of the travel of received light, along with the additional limitations of claim 17.

Finally, in regard to claim 27, the Applicant argues that the Cathey reference does not teach the limitations that a "...sum of the image data values comprising intensity values for a single color component for a single pixel location are equal to an intensity value of the accessed image data for the single color component for the single pixel location" (See Remarks, Pg. 10). However, as will again be noted in further detail below, the Examiner believes that the Colvocoresses reference sufficiently teaches the limitations of the amended claim 27, and thus the arguments regarding claim 27 are moot in view of this new ground of rejection.

### *Claim Objections*

Claims 24-26 are objected to because of the following informalities: The status identifiers in the amendment dated August 17, 2007 list claims 24-26 as "Original". However, these claims were withdrawn from consideration as non-elected claims in the reply filed by the Applicant on April 30, 2007. Thus, the status identifiers for claims 24-26 should read "Withdrawn", and the claims will be treated as such for examination. Appropriate correction is required.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

**Claims 1-7, 9-11, 15, 16, and 27 are rejected under 35 U.S.C. 102(b) as being anticipated by Colvocoresses (U.S. Pat. 4,765,564).**

First, in regard to **claim 1**, the Colvocoresses reference teaches an imaging apparatus comprising an optical device (optic means) configured to receive light and to provide a plurality of color components (i.e. blue, green, and red color bands) of the received light, an image sensor including a plurality of color sensor arrays (detector arrays) arranged elevationally over one another and configured to receive respective ones of the color components (blue, green, and red), and the color sensor arrays individually comprising a plurality of sensors configured to provide image data for a plurality of pixels of a respective one of the color components at an initial resolution, wherein the plurality of color sensor arrays overlap and are offset with respect to one another (as illustrated in Fig. 2b) to define a plurality of sub-pixels for individual ones of the pixels, and processing circuitry (computer program means) configured to access the image data for pixels from each of the plurality of color sensor arrays (blue, green, and red), and using the accessed image data, to determine sub-pixel image data for the respective sub-pixels to form an image of an increased resolution compared with the initial resolution of the color sensor arrays. Please refer to Figs. 2b, 3b, 5, and 7, and Col. 3, Line 4 – Col. 4, Line 42, and Col. 4, Line 55 – Col. 6, Line 32.

In regard to **claim 2**, the limitations of claim 1 are taught above, and the Colvocoresses reference further teaches that the arrays comprise a plurality of photodetectors at individual pixels

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to detect respective color components of light (i.e. blue, green, and red), as is taught in Figs. 2b and 3b, and Col. 3, Line 4 – Col. 4, Line 42.

As for **claim 3**, again the limitations of claim 1 are set forth above, and Colvocoresses teaches that each of the sub-pixels comprise red, green, and blue color components, and the plurality of color sensor arrays comprise red, green, and blue color sensor arrays, as is taught in Figs. 2b and 3b, and Col. 3, Line 4 – Col. 4, Line 42.

Considering **claim 4**, the limitations of claim 3 are taught above, and Colvocoresses teaches that overlapping of the red, green, and blue color sensor arrays (as shown in Fig. 3b) enables determination of the image data at an increased number of physical locations (i.e. nine sub-pixels are produced from each basic pixel) within the individual ones of the pixels to create an image of a higher resolution at a sub-pixel level. See again Figs. 2b, 3b, 5, and 7, and Col. 3, Line 4 – Col. 4, Line 42, and Col. 4, Line 55 – Col. 6, Line 32.

Next, in regard to **claim 5**, the limitations of claim 1 are set forth above, and Colvocoresses teaches that the increased resolution image is created by determining sub-pixel image data for individual pixels using the image data from each of the plurality of color sensor arrays, as taught in Figs. 2b, 3b, 5, and 7, and Col. 3, Line 4 – Col. 4, Line 42, and Col. 4, Line 55 – Col. 6, Line 32.

Regarding **claim 6**, again the limitations of claim 1 are set forth above, and Colvocoresses also teaches that the offsetting of the color sensor arrays is performed by physically shifting the plurality of color sensor arrays in a desired direction, as is illustrated in Fig. 3b and taught in Col. 3, Line 4 – Col. 4, Line 42, and Col. 4, Line 55 – Col. 6, Line 32.

In regard to **claim 7**, the limitations of claim 1 are taught above, and Fig. 7 illustrates that the optical device is configured to output the color components in a direction which is the same as the direction of travel of the received light.

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Considering **claim 9**, the limitations of claim 1 are set forth above, and Colvocoresses teaches that the color sensor arrays (shown in Figs. 2b and 3b) are configured in an offset arrangement with respect to one another and with respect to a direction of travel of the received light. See again Col. 3, Line 4 – Col. 4, Line 42, and Col. 4, Line 55 – Col. 6, Line 32.

Next, regarding **claim 10**, Colvocoresses discloses an imaging apparatus comprising an image sensing means implemented as a single device (i.e. a single image sensor comprising a plurality of detector arrays) and including a plurality of color sensor arrays (arrays for red, green, and blue, as shown in Fig. 2b), individual sensor arrays comprising a plurality of sensor means for providing image data for a plurality of pixels of a respective color component at an initial resolution, wherein individual ones of the sensor arrays are arranged elevationally over one another in a layered stack (as shown in Fig. 3b) of the image sensing means for individually detecting red, green, and blue components of light, respectively, wherein the plurality of sensor means of respective color sensor arrays are arranged in an offset relationship with respect to one another in the single device (again shown in Fig. 3b) for defining a plurality of sub-pixels of individual ones of the pixels, and processing means (computer program means) for accessing the image data for at least one pixel from each of the plurality of color sensor arrays, and using the accessed image data to form an image of an increased resolution compared with the initial resolution of the color sensor arrays. Please refer to Figs. 2b, 3b, 5, and 7, and Col. 3, Line 4 – Col. 4, Line 42, and Col. 4, Line 55 – Col. 6, Line 32.

As for **claim 11**, the limitations of claim 10 are taught above, and Colvocoresses also teaches that the offset is achieved by a shift of layers of the sensor means (illustrated in Fig. 3b) in the image sensing means. Please refer again to Col. 3, Line 4 – Col. 4, Line 42, and Col. 4, Line 55 – Col. 6, Line 32.

Considering **claim 15**, the limitations of claim 10 are set forth above, and the Colvocoresses reference discloses that the sensor means are offset in a depthwise direction with

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respect to the direction of received light, as illustrated in Fig. 2b and taught in Col. 3, Line 4 – Col. 4, Line 42.

Regarding **claim 16**, again the limitations of claim 10 are taught above, and Colvocoresses further teaches that the processing means comprises means for determining the sub-pixel image data for the respective sub-pixels of an individual pixel using the accessed image data of the respective individual pixel, and the processing means further comprises means for forming an image of the increased resolution. Please refer to Col. 4, Line 55 – Col. 6, Line 32.

Finally, considering **claim 27**, the Colvocoresses reference discloses an article of manufacture comprising a processor-usable medium (computer program means) comprising processor-usable code configured to cause processing circuitry to perform processing comprising accessing image data for at least one pixel from each of a plurality of color sensor arrays (red, green, and blue array) at an initial resolution, and forming an image of increased resolution, compared with the initial resolution of individual ones of the color sensor arrays, using the accessed image data, wherein the color sensor arrays are offset with respect to one another providing a plurality of image data values for at least one color component for a single pixel location and wherein a sum of the image data values comprising intensity values for a single color component for the single pixel location are equal to an intensity value of the accessed image data for the single color component for the single pixel location. Please refer to Figs. 2b, 3b, 5, and 7, and Col. 3, Line 4 – Col. 4, Line 42, and Col. 4, Line 55 – Col. 6, Line 32.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the



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invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

**Claims 8 and 17-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Colvocoresses (U.S. Pat. 4,765,564) in view of Akami et al. (U.S. Pat. 3,942,154).**

Regarding **claim 8**, the limitations of claim 1 are taught above, and while Colvocoresses does teach an optical device in Fig. 7 wherein the different bands of light are emitted separately (as shown in Fig. 2b), the Colvocoresses reference fails to specifically teach that the optical device is a prism. However, noting the Akami reference, Akami teaches an imaging apparatus wherein the optical device to separate the different color bands is a prism (15), as is taught in Fig. 3 and Col. 3, Lines 42-58. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have incorporated the prism of Akami with the optical system of Colvocoresses, as the splitting of different color bands using a prism enables each sensor array to correspond to wavelengths of individual colors (as taught by Akami in Col. 3, Lines 54-58), as opposed to solely relying on color filters on each sensor array to filter out specific colors.

Next, considering **claim 17**, the Colvocoresses reference teaches an image data processing method comprising providing image data using an image sensor, the providing comprising receiving light traveling in a direction using an optical device (shown in Fig. 7), receiving light components using a plurality of color sensor arrays of the image sensor, wherein the color sensor arrays have an initial resolution, generating image data using the color sensor arrays, accessing the image data from each of the plurality of color sensor arrays, and forming an image having an increased resolution compared with the initial resolution of the color sensor arrays using the accessed image data (See Figs. 2b, 3b, 5, and 7, and Col. 3, Line 4 – Col. 4, Line 42, and Col. 4, Line 55 – Col. 6, Line 32). What Colvocoresses fails to specifically teach is that using the optical device, providing the light into a plurality of light components corresponding to different wavelengths of light and outputting individual ones of the light components in the same

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direction of travel of the received light. However, noting the Akami reference, Akami teaches a optical device to separate the different color bands via a prism (15), as is taught in Fig. 3 and Col. 3, Lines 42-58. The light components are output in the same direction of travel of the received light, as is again shown in Fig. 3. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have incorporated the prism that divides the plurality of light components, as taught by Akami, with the optical system of Colvocoresses, as the splitting of different color bands using a prism enables each sensor array to correspond to wavelengths of individual colors (as taught by Akami in Col. 3, Lines 54-58), as opposed to solely relying on color filters on each sensor array to filter out specific colors.

Considering **claim 18**, the limitations of claim 17 are taught above, and Colvocoresses further discloses that the forming comprises determining sub-pixel image data from the accessed image data, and using the sub-pixel image data to form the image having increased resolution. See Col. 4, Line 55 – Col. 6, Line 32.

In regard to **claim 19**, again the limitations of claim 17 are taught above, and Colvocoresses teaches that the image having increased resolution is formed at a sub-pixel level, as is again shown in Col. 4, Line 55 – Col. 6, Line 32.

Regarding **claim 20**, the limitations of claim 17 are taught above, and Colvocoresses teaches that the color sensor arrays overlap and are offset with respect to one another in the direction of travel of the received light, as is taught in Figs. 2b and 3b, as well as in Col. 3, Line 4 – Col. 4, Line 42, and Col. 4, Line 55 – Col. 6, Line 32.

Considering **claim 21**, the limitations of claim 17 are set forth above, and Akami teaches that the optical device is a prism (15), as is taught in Fig. 3 and Col. 3, Lines 42-58.

Finally, regarding **claim 22**, again the limitations of claim 17 are taught above, and Akami also teaches that the optical device is a lens in Fig. 3 and Col. 3, Lines 42-58.

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*Conclusion*

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gregory V. Madden whose telephone number is 571-272-8128. The examiner can normally be reached on Mon.-Fri. 8AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ngoc Yen Vu can be reached on 571-272-7320. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Gregory Madden  
October 24, 2007



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